VII.—On the Copeognatha from Mt. Murud and Mt. Dulit, Sarawak.

By H. H. Karny, Buitenzorg, Java.

(With one Plate.)

The specimens described below were collected for the Sarawak Museum by Dr. E. Mjöberg on Mts. Murud and Dulit in Northern Sarawak in 1923.

Family MYOPSOCIDAE.

Key to the Genera of Malaysian Myopsocidae.

1. Fore wing along the anal vein turned up into a large sack-like processus *Lophopteryella* Enderlein.

1′. Fore wing without an anal sack.

2. Areola postica connected with medial vein by a short cross vein. Radial sector of hind wings connected with media by a somewhat long cross vein *Lichenomima* Enderlein.

2′. Areola postica broadly united with medial vein.

3. Radial sector of hind wings broadly united with medial vein *Phlotodes* Enderlein.

3′. Radial sector of hind wings connected with media by a cross vein *Myopsocus* Hagen.

Phlotodes mjöbergi n. sp.

General colour yellow-brown (balsam slide ex alcohol). Maxillary palpi pale, yellowish, black at extreme tip of apical joint. Antennae yellowish, closely beset with stiff hairs, nearly twice as long as the joints are wide. Femora pale brownish-yellow. Tibiae pale yellowish, black at extreme tip; first tarsal joint pale yellowish, second and third ones black. First tarsal joint of hind leg with 26 ctenidia, each of them with 5 teeth; second joint with one, third also with one ctenidium, each of them with 7 teeth. Claws of a similar shape as in *P. kolbei*.

Length of hind tarsal joints: I 0.6 mm., II 0.08 mm., III 0.1 mm.

Fore wing three times as long as wide, rounded at apical margin. General colour hyaline, closely dotted with brown; these dots confluent at some places of wing to larger spots and thus forming an angulate cross band at the end of the basal third of wing, then a spot at the basal half of pterostigma till the branching of media from radial sector, finally a spot at the distal half of areola postica till the branch of medial vein. These spots (and the basal cross band) with very dark margins, surrounded with hyaline, especially along both margins of cross band, and a larger hyaline spot about in the middle of wings, between the fore and hind marginal brown spots. The remainder of wings closely dotted, especially in the apical part and at extreme base of wing. Pterostigma very closely and confluently dotted with brown in basal half, bright yellow in the widened apical half; there bluntly rounded at its hind margin. Radial sector united for some distance with medial vein. Hind wings hyaline, dotted with brown at the fore margin; venation as in *P. kolbei*.

Length of body 3.5 mm.; fore wings 5 mm. long, 1.7 mm. wide.

I have the pleasure of naming this new species after its discoverer, the famous Swedish Entomologist, Dr. Erik Mjöberg.

One specimen from Mt. Murud, 6000--7000 feet, headquarters, collected in October by Dr. E. Mjöberg.

This is the largest hitherto known species of the genus, differing from the New Guinean *P. kolbei*, by the number of hind tarsal ctenidia. The Philippine *P. barkeri* Banks and the New Guinean *P. loriai* Ribaga—if they belong also to the same genus which is not yet quite sure—are also smaller than my Sarawak species and may be further distinguished by a somewhat different coloration of fore wings. The Philippine *P. enderleini* Banks seem to belong to *Lichenomima*—at least so according to a specimen which I owe to the kindness of Prof. Ch. F. Baker.

Family PSOCIDAE.

Psocus murudensis n. sp.

General colour brown (balsam slide ex alcohol); legs somewhat paler, tarsi and the tips of tibiae dark brown. Maxillary palpi very dark, nearly black. Antennae beset with $\frac{1}{4}$ mm. long, stiff, slightly curved bristle-hairs. The two short basal

joints pale brown; the third (i.e., the first long) joint of the same colour, but dark at the tip, the following joints blackish-brown. First joint of hind tarsi with 20, second joint with 4 ctenidia; each ctenidium with about 6 teeth. Claws slender, with a sharp tooth before the apex. Length of hind tarsal joints: I 0.6 mm., II 0.24 mm.

Fore wings (Plate 3) more than three times as long as wide. Radial sector communicating with media for some distance. Areola postica very broadly united with medial vein. Coloration similar as in *P. brioi* Enderlein, *P. mali* Okamoto and especially *P. kurokianus* Enderlein, but not quite agreeing with any of those species (vide fig.). Hind wings hyaline; radial sector united with medial vein for a relatively long distance (about as in *P. kurokianus*, longer than in *P. mali*, shorter than in *P. biroi*).

Length of body 3.4 mm.; fore wings 5 mm. long, 1.5 mm. wide.

One specimen from Mt. Murud, 6000--7000 feet, head camp, coll. E. Mjöberg.

According to the coloration of fore wings and the length and structure of tarsal joints coming between the New Guinean *P. biroi* and the Japanese *P. kurokianus* and *P. mali*. The second joint of hind tarsi is relatively shorter than in both these Japanese species, but longer than in *P. biroi*. Accordingly it has many less ctenidia than in *P. mali* and *P. kurokianus*; in regard to *P. biroi*, Enderlein did not mention their number.

Hemipsocus hyalinus Enderlein.

1906. Enderlein, Stett. Ent. Zeit., p. 311.
1907. Okamoto, Trans. Sap. Nat. Hist. Soc., ii, p. 135.

General colour dark brown, nearly black; pale brown when freshly emerged. The two basal joints of antennae brown, all following ones brownish-black. As Enderlein and Okamoto described the colour as much paler, I think their descriptions may have been based on freshly emerged specimens. I cannot separate the Bornean specimens before me from the Japanese species by reason of these colour differences, because they agree with those in all other respects perfectly. Length of hind tarsal joints: I 0.8 mm., II 0.16 mm. Number of ctenidia as stated by Enderlein. Fore wings hyaline; radial sector communicating with medial vein for a rather short distance. Cross vein between media and areola postica extremely short.

Length of body 3.3 mm.; fore wing 3.4 mm. long, 1.2 mm. wide.

Five specimens from Mt. Dulit, 3000 feet, coll. Dr. Mjöberg; one from Mt. Murud, 6000--7000 feet, head camp, coll. Dr. Mjöberg. The species was known hitherto from Japan only.

Family CAECILIDAE.

Calopsocus infelix (Hagen). (Plate 3, fig. 2).

1858. Hagen, Verh. zool. bot. Ges. Wien, p. 475 *(Psocus)*.
1859. Hagen, l. c., p. 204, 205 *(Psocus)*.
1866. Hagen, l. c., p. 214.
1903. Enderlein, Ann. Mus. Nat. Hung., i, p. 246.
1904. Enderlein, Zool. Jahrb., Abt. Syst., xx, 2, p. 106.

One specimen from Serambo River (coll. Dr. E. Mjöberg) having the upper fork of hind wings (fig. 2), as the Philippine *C. rizali* Banks, much shorter than the lower one, and shorter than in Enderlein's figure of 1903. (Plate VI, fig. 22a).

I place this specimen, nevertheless, near to *C. infelix* as the fore wings are net-veined near the middle only, behind pterostigma, not throughout the whole distal half as they are in *C. rizali* and *C. iridescens*. Moreover, the *C. infelix* specimen from New Britain, figured by Enderlein in 1904 (Plate VII, fig. 1), has also the upper fork on hind wings distinctly shorter than the lower one, and shorter than in Enderlein's figure of 1903. The further details of venation are very variable, as may be seen from comparing the figure given here with those of Enderlein.

Length of body 3.8 mm.: fore wing 4.2 mm. long, 2 mm. wide; length of hind tarsal joints: I 0.52 mm., II 0.15 mm.

Epipsocus nubilipennis n. sp. (Plate 3, fig. 3).

General colour brown (balsam slides ex alcohol). Legs and antennae paler, yellowish-brown; last tarsal joint (of all legs) and last joint of maxillary palpi dark brown. Antennae closely set with stiff bristle-hairs which are more than twice as long as the joints wide. All tibia very closely set with stiff bristles. First joint of middle tarsi with 24--26 ctenidia, second one with 4; first joint of hind tarsi with 36, second one with 7 ctenidia. Length of hind tarsal joints: I 0.9 mm., II 0.2 mm.

Fore wings (fig. 3) nearly three times as long as wide; margins and veins set with strong bristles. Cross vein between radial sector and medial vein longer than the base of radial sector (from its arising till the cross vein). Radial fork longer than the shaft. Branches of radial sector and media slightly S-curved. Areola postica very long and narrow, scarcely wider than the distance from medial vein. General colour pale brownish, with some larger hyaline spots between the veins and along the apical margin. The brownish colour somewhat darker in four irregular, nebulose bands across the wing. At the marginal ends of all veins a small, dark brown spot. Hind wings very pale yellowish, nearly hyaline, darkened at extreme base, and with a small dark spot at the marginal end of media. Radial sector united with medial vein for a short distance. This distance hardly half as long as the base of media before it; both together about as long as base of radial sector; this arising from radius almost perpendicularly. In one of the six specimens radial sector of hind wings connected with media by a very short cross vein.

Length of body 3.2 mm.; fore wings 4.5 mm. long, 1.6 mm. wide.

Six specimens from Mt. Dulit, 3000 feet, January, by lamp at night, coll. Dr. E. Mjöberg.

This new species resembles somewhat the coloration of fore wings in the New Guinean *E. marginatus* Enderlein and the Philippine *E. completus* Banks but the brownish colour is here more extended than in both these species.

EPIPSOCUS DUBIUS n. sp.

General colour dark brown (balsam slides ex alcohol). Legs and antennae yellowish-brown. Second tarsal joint not darker than the first one. Maxillary palpi somewhat darkened at extreme apex only. Number of ctenidia: middle tarsi I 24, II 5; hind tarsi I 30, II 6. Length of hind tarsal joints: I 0.85 mm., II 0.2 mm.

Veins of the fore wings as in *E. nubilipennis*. Colour uniformly pale yellowish-brown, without hyaline spots; small dark spots (as in the preceding species) at the end of all veins and in the basal part of pterostigma. Hind wings as in *E. nubilipennis*, but in both the specimens before me radial sector connected with media by a short cross vein.

Length of body 2.5 mm.; fore wings 3.5 mm. long, 1.2 mm. wide.

Two specimens from Mt. Dulit, 3000 feet, January, by lamp at night, coll. Dr. E. Mjöberg. It is not impossible that they represent only a smaller, darker variety of the foregoing species.

CAECILIUS TENUICORNIS n. sp. (Plate 3, fig. 4).

General colour dark brown (balsam slide ex alcohol). Legs paler, brownish-yellow; fore tibiae very dark brown, nearly black (darker than the body). Apical joint of maxillary palpi brownish-black. Antennae scarcely half as thick as in *C. fuscopterus*, very pale, the three basal joints yellow, the following ones more greyish. First joint of hind tarsi with 18 ctenidia, second joint without such. Claws brownish-black, the sharply pointed tip curved and yellow. Length of hind tarsal joints: I 0.85 mm., II 0.12 mm.

Colour of fore wings practically as in the European *C. fuscopterus*, very dark brown, with hyaline length bands along the fore and hind margin. The fore marginal band reaching from base of pterostigma till halfway between the ends of the last branch of radial sector and the first branch of media; this band not reaching the stem of radial sector which is followed anteriorly by dark coloration; interrupted by three narrow, dark cross bands, viz., along the end of pterostigma and along both branches of radial sector: all these three cross bands continued from fore margin till the dark colour of wing surface. Pterostigma yellowish. Medial vein followed anteriorly by a curved, pale stripe in the neighbourhood of the origin of its hind branch. The hind marginal hyaline band following the anal vein, then the hind margin, about as wide as the areola postica, then narrowing to tip and reaching as a very narrow stripe till the end of middle branch of medial vein. Communication between radial sector and media in one fore wing extremely short, nearly a point only, in the other one substituted by a very short cross vein. Branches of radial sector somewhat more perpendicular to the margin than in *C. fuscopterus*, and more widely distant from tip of wing than in that of European species. Their common shaft about one and a half times as long as the branches. Areola postica (fig. 4) much smaller than in *C. fuscopterus*, hardly wider than the distance of medial vein.

Hind wings practically as in *C. fuscopterus*, but the fore branch of radial sector almost perpendicular to the margin. General colour dark greyish (but much paler than the fore

wings), with a hyaline length band along fore margin from about the middle of this margin till the end of the hind branch of radial sector. First branch of radial sector narrowly bordered with greyish on both sides. Anal vein followed by a hyaline stripe.

Length of body 2.7 mm.; fore wings 3.7 mm. long, 1.1 mm. wide.

One specimen from Mt. Dulit, 3000 feet, January, at night (light), coll. Dr. E. Mjöberg.

This species resembles the European *C. fuscopterus*, differing from it chiefly by the thinner, pale antennae, and by the much smaller areola postica. It resembles also *C. javanus*, but has the fork of radial sector much shorter than its stem, and the hind marginal hyaline band produced much further tipwards only reaching to the proximal part of areola postica according to Enderlein. The size of *C. javanus* is much smaller than that of *tenuicornis*, the fore wings being 2.2 mm. long.

Caecilius borneensis n. sp. (Plate 3, fig. 5, above).

General colour dark brown (balsam slide ex alcohol). Maxillary palpi (fig. 5) very dark greyish-brown, darker than body. Apical joint more than twice as long as the preceding one, distad scarcely enlarged. Antennae (fig. 5) short and very thick, distinctly shorter than the fore wing. The two basal joints brown, the following ones very dark grey-brown. Eyes black, globose, very much protruding. Space between them nearly twice as wide as the eyes themselves. Legs about as dark as the body, tibia more greyish-brown; tarsi pale grey-brown. First joint of hind tarsi with 10 ctenidia; second joint a little more than half as long as the first one, without ctenidia.

Length of hind tarsal joints: I 0.22 mm., II 0.12 mm.

Fore wings greyish-brown, with a dark spot in the distal half of pterostigma and behind the hind angle of it; a second one between the base of radial sector and medial vein. Pale, nearly hyaline are: costal cell, a stripe along fore margin of radial cell, a spot behind base of pterostigma, another one at the communication of radial sector and media, a stripe along anal vein, and a spot at the proximal part of areola postica. Pterostigma with a blunt angle behind. Communications between radial sector and media very short, about $\frac{1}{4}$ the length of basal part of Rs. Fork of radial sector much narrower than

in *C. gonostigma*, its common shaft slightly S-curved, about $1\frac{1}{2}$ times or more as long as the fork. Fore branch of medial vein moderately long. Areola postica moderately large, with rounded fore margin, about one and a half times as wide as the distance from medial vein. Anal vein not pubescent.

Hind wings pale greyish, much paler than the fore pair, with a darker, brownish spot along fore margin in basal half, and another one between base of radial sector and medial vein. Basal part of radial sector about one and a half times as long as the communication between this vein and media, and a little shorter than the base of medial vein. Fore branch of radial sector nearly perpendicular to the fore margin (the angle distinctly more than 60°), hind branch almost parallel to the fore margin, about as long as the fork shaft. Media slightly S-curved.

Length of body 2.0 mm.; of antennae 1.7 mm.; fore wings 2.8 mm. long, 0.85 mm. wide.

One specimen from Mt. Murud, 7200 feet, coll. Dr. E. Mjöberg.

This new species comes by the colour of wings and the shape of pterostigma near to the Japanese *C. trigonostigma* Enderlein and the Japanese *C. gonostigma* Enderlein. It differs from both these species by the thick, short, dark antennae, the much less numerous ctenidia of first hind tarsal joint, and by some details of wing venation.

Caecilius mjöbergi n. sp. (Plate 3, fig. 5, beneath).

In general appearance very similar to the preceding species, but somewhat larger and the coloration of fore wings more distinct. General colour dark, abdomen more yellowish-brown (balsam slide ex alcohol). Maxillary palpi (fig. 5, beneath) pale grey-brown, much paler than the body; apical joint blackish at tip, about one and a half times as long as the preceding joint, distinctly widened distad. Antennae (fig. 5, beneath) longer and more slender than in *C. borneensis*; the two basal joints yellowish-brown, third and fourth somewhat darker, the following ones dark grey-brown. Eyes similar as in the preceding species, but larger and much more approximated to each other. Legs brownish-yellow, paler than body, second tarsal joint and the tip of the first one dark grey-brown. First joint of hind tarsi with 26 ctenidia, three and a half times as long as the second one; this latter without ctenidia. Length of hind tarsal joints: I 0.45 mm., II 0.13 mm.

Coloration of fore wings as in *Fülleborniella singaporensis* (see Enderlein's figure, 1903, Ann. Mus. Nat. Hungar., i, Pl. vii, fig. 36). It differs, however, from this species by the generic character (the entirely wanting cross vein behind pterostigma) and by some other details of wing venation. Fork of radial sector much narrower than in *Fülleborniella*, its fore branch being about one and a half times as long as the marginal space between the branches; common shaft slightly S-curved, about twice as long as the fore branch. Areola postica large, with rounded fore margin, about twice as wide as the distance from medial vein. Hind wings nearly hyaline. Radial vein straight, enclosing with the fore margin a very acute angle, not angulately curved to the fore margin before apex as it is in *F. singaporensis* (see Enderlein's figure). Basal part of radial sector about one and a half times as long as (in *F. singaporensis* shorter than) the communication of this vein with media; base of medial vein about one and a half times as long as that of radial sector. Distal part of media almost parallel to the hind branch of radial sector. Cubital vein shorter than in *F. singaporensis*, very slightly S-curved (much less than in that species).

Length of body 2.5 mm.; of antennae 3.8 mm.; fore wing 3.8 mm. long, 1.35 mm. wide.

I have allowed myself the pleasure of naming this new species in honour of Dr. E. Mjöberg, late Curator of Sarawak Museum.

One specimen from Mt. Murud, 6000--7000 feet, November 14, coll. Dr. E. Mjöberg.

Differing from the preceding species by the more distinct coloration of fore wings, the slender antennae, the shape of last joint of maxillary palpi, the much longer basal joint of hind tarsi set with more numerous ctenidia.

KOLBIA MACULIPENNIS n. sp. (Plate 3, fig. 6).

General colour very dark chestnut-brown, head and thorax nearly blackish (balsam slide ex alcohol). Antennae short and thick, much shorter than the fore wing, dark greyish-brown, set with some bristle hairs, which are about twice as long as the antennae joints are wide. Head closely set with bristles. Eyes globose, protruding, not very large; the distance between them more than twice as wide as the eyes themselves. Legs as dark as the body; tarsi much paler, yellowish-grey. Basal joint of hind tarsi with 11 very small ctenidia; apical joint without such.

Length of hind tarsal joints : I 0.24 mm., II 0.21 mm.

Fore wings more than three times as long as wide, on the veins and on whole surface set with strong bristles (fig. 6); those on margins in two or three rows. General colour brown, with greyish hyaline stripes in the costal and radial cell (this latter except the apical part) and along anal vein, at its end widened to a larger spot; further a greyish hyaline spot at basal part of pterostigma and in the neighbouring part of cell R1, from here produced as an irregular stripe till the base of areola postica. Finally, the space from fork of radial sector till the base of the branch of medial vein also greyish hyaline. Distal part of pterostigma very dark brown. Hind margin of pterostigma backwards produced almost rectangularly. Communication of radial sector and medial vein shorter than the base of radial sector before it, and this shorter than the basal part of media. Fork of radial sector somewhat narrow, much shorter than the common shaft, which is very slightly S-curved. Areola postica broadly rounded, but not angulately produced as in *Dasypsocus*, about twice as wide as the distance from media; its distal margin almost perpendicular to the hind margin of wing.

Hind wings greyish, darker along fore margin in basal half, then nearly hyaline along fore margin till the end of radial vein, then dark again in surrounding of the fore branch of radial sector. Basal part of radial sector before the communication with media about half as long as the base of medial vein, this as long as the communication. Hind branch of radial sector about as long as the shaft, twice as long as the fore branch; this slightly curved (concave basad) arising in an angle of about 60°, ending at the fore margin almost perpendicularly. Medial and cubital vein slightly S-curved, the latter less than the former.

Length of body 2.2 mm.; of antennae 1.7 mm.; fore wing 2.5 mm. long, 0.7 mm. wide.

One specimen from Mt. Murud, 7200 feet, coll. Dr. E. Mjöberg.

Differing from the hitherto known *Kolbia* species by the spotted fore wings; from *Dasypsocus* by the shape of areola postica, from *Ophiodopelma* by the much less S-curved fork-shaft of radial sector, from *Caecilius* by the strong bristles on veins and on the whole surface of fore wings.

HEMICAECILIUS NIGROGUTTATUS n. sp. (Plate 3, fig. 7).

General colour dark grey-brown (balsam slide ex alcohol). Apical joint of maxillary palpi black. Head and humeral angles of thorax set with about 0.2 mm. long bristles, especially the fore margin of head with very rough bristles. Antennae slender, two-thirds as long as the fore wings; the two basal joints thick, nearly as dark as the body; the following ones very pale yellowish, set with long scrubby bristles (length of bristles 0.15 mm.). Legs as dark as the body, middle part of tibiae very slightly paler. First joint of hind tarsi with 12 ctenidia, second one without such. Length of hind tarsal joints: I 0.25 mm., II 0.10 mm. Apical segments of abdomen set with long bristle-hairs.

Fore wings (fig. 7) almost three times as long as wide, hyaline, with large blackish spots in the centres of cells and along the margins, except the cell distad from pterostigma and that distad from areola postica which are hyaline. All veins, except the anal one, set with long, strong bristles; margins of wing with two or three bristle rows. Communication between radial sector and medial vein only a very little shorter than the basal parts of these veins before it. Fork of radial sector wide and short, its marginal distance between the branches longer than the fore branch; the common stem quite straight, about twice as long as the fore branch. Medial vein two-branched; its stem strongly curved (convex backwards), more than twice as long as the fork; this very small and relatively wide. Areola postica small, with broadly rounded fore margin, hardly wider than the distance from medial vein.

Hind wings pale grey, with a hyaline stripe along the anal vein. Margins set with long bristle-hairs, veins without such. Basal part of medial vein more than twice as long as that of radial sector; communication between both these veins longer than both their bases together. Media distad from communication S-curved. Hind branch of radial sector about as long as the fork-shaft, fore branch scarcely half as long, not quite perpendicular to the fore margin.

Length of body 3.0 mm.; of antennae 1.9 mm.; fore wing 3.0 mm. long, 1.1 mm. wide.

One specimen from Mt. Dulit, 3000 feet, January, at night (light), coll. Dr. E. Mjöberg.

This new species comes by the two-branched medial vein of fore wings to the genus *Hemicaecilius*, and differs from all the hitherto known species of this genus by the strongly blackish

spotted fore wings. As to the wing venation, it comes nearest to *H. suzukii* Okamoto, differing from *H. limbatus* Enderlein by the shorter fork of radial sector and the smaller areola postica. It is the first species of the genus known from the Malaysian region.

Peripsocus ignis Okamoto.

1910. Okamoto, Ann. Mus. Nat. Hungar., viii, p. 189, Plate iii, fig. 2.

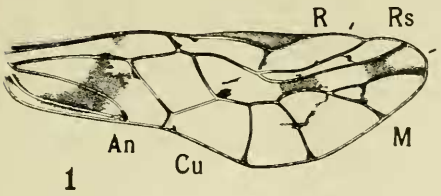
I place as this Japanese species one specimen from Mt. Murud (6000--7000 feet, headquarters, October, coll. Dr. E. Mjöberg) which differs very slightly only from Okamoto's figure and description. Fore and middle femora pale, yellowish; tibiae very dark, almost black. Hind legs more uniformly coloured. Ctenidia as described by Okamoto. Fore wings with a very indistinct paler cross-band from base of pterostigma till the end of cubital vein, and a little paler along anal vein.

Length of body 2.4 mm.; of antennae 1.9 mm.; fore wings 2.9 mm. long, 1.0 mm. wide. Length of hind tarsal joints: I 0.26 mm., II 0.11 mm.

The species was known hitherto from Japan only (Ochiai, Isle of Yezo).

Explanation of Plate 3.

Fig. 1. Fore wing of *Psocus murudensis* n. sp.
,, 2. Wing venation of *Calopsocus infelix* Hagen.
,, 3. Fore wing of *Epipsocus nubilipennis* n. sp.
,, 4. Areola postica of *Caecilius tenuicornis* n. sp. from Mt. Dulit (above) and *C. fuscopterus* from Central Europe (beneath)
,, 5. *Caecilius mjöbergi* n. sp. (above) and *C. borneensis* n. sp. (beneath). End of antennae (left) and maxillary palpi (right).
,, 6. Fore wing of *Kolbia maculipennis* n. sp.
,, 7. Fore wing of *Haemocaecilius nigroguttatus* n. sp.



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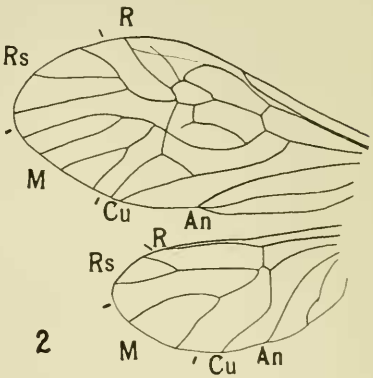

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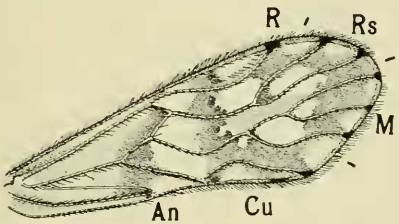

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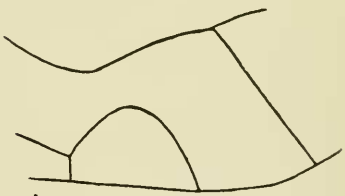
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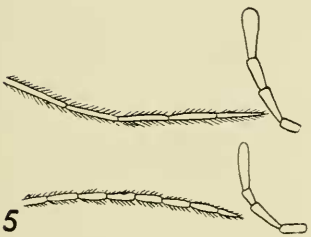
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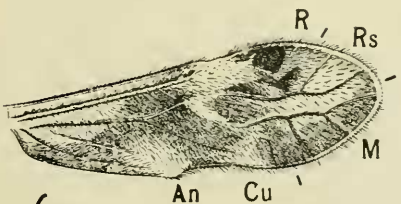

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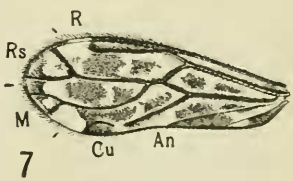

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